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STATE OF CALIFORNIA - BUSINESS, TRANSPORTATION AND HOUSING AGENCY

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

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FCC - MAIL ROOM

June 25, 1993

93-61

Ms. Donna Searcy, Secretary
Federal Communications Commission
1919 M Street
Washington, DC 20554

Dear Ms. Searcy:

Pursuant to Section 1.415 of Federal Communications Commission Rules and Regulations, we are submitting the attached original comments and nine copies in response to the Notice of proposed rule making PR Docket No. 93-61, Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic 16 Vehicle Monitoring Systems.

The Commission's attention to this response will be appreciated.

If you have any questions regarding our submittal, you may wish to have your staff contact Mr. John Schmidt at (916) 654-6709.

Sincerely,

GARY ADAMS, Chief
Office of Telecommunications

Enclosures

cc: JSchmidt
GNash

BW:tc

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Before the

Federal Communications Commission

Washington, D. C. 20554

cost. The provision of adequate transportation services for persons not now adequately served by any transportation mode, particularly the disadvantaged, the elderly, the handicapped, and the young, should be an integral element of the planning process. Stimulation of the provision of transportation not only for speed and efficiency of travel, but also for convenience and enjoyment in shopping, school, cultural, and business pursuits, leisure time travel and pedestrian travel, is also a State aim. It is the desire of the State to provide a transportation system that significantly reduces hazards to human life, pollution of the atmosphere, generation of noise, disruption of community organization and adverse impacts on the natural environment. To achieve these goals, state of-the-art communications infrastructures must be employed. The need to utilize Automatic Traffic Management Systems (ATMS) has been recognized.

ATMS are merging voice, data and video information to keep the highways of California running smoothly into the next century. ATMS provide the nucleus for Intelligent Vehicle Highway Systems (IVHS) which will include Automatic Vehicle Monitoring (AVM) Systems, and Automatic Vehicle Identification (AVI) Systems at many locations throughout the State.

The IVHS Act

The Intelligent Vehicle Highway System (IVHS) Act, enacted by Congress in 1991, set as a national goal, the implementation of an IVHS infrastructure to increase vehicle capacity, improve efficiency and safety for the nation's highway system and to become an alternative to the construction of additional highways.

California State Senate Bill No. 1523 as approved by Governor Wilson and filed with the Secretary of State on September 20, 1990, mandated action be taken by Caltrans to develop and adopt specifications and standards for Automatic Vehicle Identification (AVI) System Equipment as an integral part of California's IVHS.

Caltrans, Division of New Technology, in concert with the University of California's Lawrence Livermore National Laboratory have provided a prototype AVI System and compatibility specifications for AVI equipment. See appendix A.

License applications have been filed with the commission and system installations will

Although Electronic toll collection is the initial application of this short range communication. The protocols developed for collecting tolls were designed to be expandable into other applications. Potential vendors for California electronic toll transponders are reportedly designing in Universal Asynchronous Receiver/Transmitter (UARTS) to allow the tags to be used as general purpose communication devices between vehicles and the infrastructure. Below is a short list of some applications that could co-exist

- Vehicle Navigation Systems would be very inexpensive to manufacture and would have no user fees if there were enough short range beacons to periodically fix position. Virtually every use of short range communication would have the side benefit of also being a navigational beacon.

Once a national standard is set and adequate spectra are assured, short range roadway to vehicle communication will expand into many new areas of service. Because these systems are so short range, there should be no need for additional radio frequency spectra as the applications expand. We can not imagine a more effective use of radio spectra.

Caltrans does, however, have some concerns. We are concerned that inappropriate regulation will negatively impact the use of short-range communication in the 902 to 928 MHz band. Below are some of these concerns:

Extreme Specification for Spillover

The Docket mentions restricting spillover to "be attenuated at least 55 + 10 log(P) db where P is the highest emission (in watts) of the transmitter inside the authorized bandwidth". This level is unnecessarily restrictive especially in a band that allows unlicensed part 15 devices to emit up to a watt.

Non compliance should be couched in terms of field strengths. Caltrans suggests a limit of 10 millivolts per meter of out of band radiation at 100 meters from an installation. Some accommodation should be included in the regulation to prohibit locating a new base station within range of an existing electronic toll collection system and vise versa.

Frequency Band Allocation

The Docket proposes splitting the 902 to 928 Mhz band into five bands. Of these, three bands are to be primarily allocation to AVI. California specification based systems, however, require six Mhz per channel. The upper and lower two Mhz bands are of no use to us. The remaining six Mhz band can only accommodate a single AVI channel and leaves no flexibility to shift frequencies in case of conflict.

Each eight Mhz AVI band represents 10 Mhz of unusable spectra for modern AVI. This represents over three quarters of the 902 to 928 Mhz band excluded from AVI use by a single application with, as yet, a single viable vendor.

Caltrans suggests that 902 to 928 Mhz be split into two bands. One contiguous eight Mhz band for AVL and one contiguous 18 Mhz band for short-range communications.

Interference with Toll Collection

Caltrans is concerned that the 902 to 928 MHz band is being used as a development ground for new applications. We are particularly concerned that equipment developed for such application be used intentionally or unintentionally to disrupt the vehicle/roadway communications which could cause serious disruption to our transportation facilities. Sharing frequencies with VCR channel changers should not be a problem unless somebody intentionally activated one in the middle of an electronic toll facility. We are concerned with what would happen if the public knew that their $20 channel changer could be used to jam the toll collection system.

RADARS

Caltrans also has concern about the use of high powered applications in this band such as radars. We are particularly concerned about low power mobile applications. These would be extremely difficult to control. Caltrans requests that such applications be licensed in the bands other than those licensed for short range roadway to vehicle communication.

SUMMARY

In Caltrans view, any division of the 902-928 MHz band should be based upon IVHS need for AVM and AVI technology. Caltrans recognizes that other services have merit, and does not object to the provision of non-IVHS services. However, Caltrans believes that the fundamental need for this proceeding, as well as the earlier AVL order, is to encourage AVM/AVI technology. Caltrans believes that the demand for the technology supports the adoption of a permanent allocation of frequencies to support IVHS.

Caltrans respectfully requests that the Commission consider the importance of a safe and efficient national transportation system and guarantee that sufficient frequencies be made available for the optimum operation of that system, in particular to support expanding IVHS technologies.

Respectfully submitted,
California Department of Transportation.

By _____
GARY ADAMS, Chief
Office of Telecommunications

APPENDIX A

CALIFORNIA COMPATIBILITY SPECIFICATION

TECHNICAL CONSIDERATIONS

The California Compatibility specification for Automatic Vehicle Identification defines the transmission and modulation schemes for use within the State. Modulated back scatter is used for the transmission of information from tag to reader. It differs from most back scatter systems currently installed in the United States in two significant respects. It employees two-way communication, and the data rate is significantly higher.

The Reader

A typical reader will transmit approximately one watt through an antenna with a gain of approximately 20 (13 db). The antenna may be aimed down at roughly -30° from the horizontal. It will have three operating states. The duty cycles of these states may be highly variable but one possible scenario is tabulated below:

STATE	TOTAL TIME	DUTY CYCLE
OFF	120 µS	10%
Modulated	600 µS	50%
Unmodulated	480 µS	40%
Total	1,200 µS	

The above example represents one possible transaction between a vehicle and a reader. Many other scenarios are probable.

The base frequency is expected to be within the 902 to 928 Mhz band. The data rate is 300 kbps. The reader-to-transponder modulation scheme is unipolar amplitude shift keying of the RF carrier using Manchester encoding.

A Manchester encoded "1' bit is transmitted by sending an RF pulse during the first half of the bit period and no signal during the second half. A Manchester encode "O" data bit uses the reverse order; i.e., no signal during the first half of the bit period and an RF pulse transmission during the second half.

The first harmonic of the modulation scheme will be at 300 khz above and below the center frequency. The third harmonic will be 900 khz. The fifth harmonic at 1.5 Mhz and will spill outside of a 2 Mhz band.

The Transponder

The transponder scatters back the RF that impinges on it. The return signal is amplitude modulated with an on/off circuit at either 600 khz or 1200 khz. These frequencies are, in turn, shifted at the 300 kbps data rate. A zero bit is represented by two cycles at 600 khz. A one bit is presented by four cycles at 1200 khz. The primary return signal from one bit will, therefore, have sidebands outside a two megahertz band.

The minimum specified field strength for the tags to function is 500 mv/m. The expected nominal operating field strength is roughly 2 v/m. The maximum specified back scatter cross section is 100 cm^2. These would result in the following power output from the transponders:

Field Strength	Emitted Modulated Power	
500 mv/m	6.63 μ watt	-52 dbw
2000 mv/m	106 μ watt	-40 dbw